# DEPARTMENT OF ENVIRONMENTAL QUALITY
## PERMITTING and COMPLIANCE DIVISION
## MONTANA POLLUTANT DISCHARGE ELIMINATION SYSTEM (MPDES)

### Statement of Basis

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|---|---|
| Permittee: | Town of Whitehall |
| Permit No.: | MT0020133 |
| Receiving Water: | Big Pipestone Creek |
| Facility Information: | |
| Name | Domestic Wastewater Treatment Facility |
| Location | Township 1N, Range 4W, Section 2, Jefferson County |
| Facility Contact: | Jerry Ward, Public Works Director<br>P.O. Box 529<br>Whitehall, MT 59759 |
| Fee Information: | |
| Number of Outfalls | 1 (for fee determination purposes) |
| Outfall – Type | 001 – Minor POTW |

I. Permit Status

This is a renewal Montana Pollutant Discharge Elimination System (MPDES) permit for the Town of Whitehall domestic wastewater treatment facility (WWTF). The previous permit was issued April 1, 1996 and expired December 31, 2000. The permittee submitted an MPDES renewal application (short form 2A) and fees in July 2000. The application was deemed complete by the Department November 27, 2000. Pursuant to the Administrative Rules of Montana (ARM) 17.30.1313, the expired permit remains effective until the renewed permit is issued. The permittee submitted updated application forms, DEQ Form 1 and EPA Form 2A, on January 30, 2008.

## II. Facility Information

### A. Facility Description

The permittee operates a 1960-constructed, two-cell facultative lagoon system that was upgraded in 1988. The design flow is 0.2513 million gallons per day (mgd) for 1480 people. The lagoons are bentonite lined and sized to provide approximately 111 days of hydraulic detention time. The Operation and Maintenance manual submitted to the Department (O&M; S & A Engineers, 1988) states that the WWTF can be operated in series or parallel mode.

The lagoon is equipped with a multi-level draw-off structure that allows for discharge from varying lagoon depths to optimize effluent quality. The system has effluent ultra-violet disinfection capability operated seasonally. Discharge is measured using a v-notch weir and staff gauge and is continuous to Big Pipestone Creek (BPC). Table 1 has the WWTF design details.

**Table 1: Current Design Criteria Summary (S+A Engineers, July 1988)**

| | |
|---|---|
| Facility Description:<br>Two-cell facultative system; continuous discharge; UV disinfection. | |
| Construction Date: 1963 | Modification Date: 1988 |
| Design Population: 1,480 | Current Population: 1044 (application) |
| Design Flow, Average (mgd): 0.251 | Design Flow, Maximum Day (mgd): unknown |
| Primary Cells: 1 | Secondary Cells: 1 |
| Number Aerated Cells: 0 | Minimum Detention Time Total System (days): 56.2 |
| Design $BOD_5$ Removal (%): unknown | Design $BOD_5$ Load (lb/day): 266 |
| Design TSS Removal (%): unknown | Design TSS Load (lb/day): 296 |
| Influent Flow (mgd): 0.137 – 0.300 | Source: Great West Engineering, 2006 PER |
| Collection System Combined [ ] Separate [X] | Estimated I/I: 40,000 gpd during wet weather |
| SSO Events (Y/N): unknown | Bypass Events (Y/N): unknown |
| Disinfection (Y/N): Y | Type: UV |
| Sludge Storage: land next to lagoons | |
| Sludge Disposal: land next to lagoons | EPA Authorization Number: None |

Great West Engineering (GW) completed a Preliminary Engineering Report (PER) for the permittee in July 2006. The lagoons were constructed in 1960 with a clay liner to prevent leakage. GW conducted a leak test on the east lagoon in the fall of 2005. Results indicated that the east lagoon alone is leaking at the rate of approximately 0.032 mgd in exceedence of Department standards by 10 to 12 times the allowable leakage rate (DEQ Circular 2, 1999). It was assumed by GW that, due to similar construction materials and date, the west lagoon is similarly leaking for a total leakage rate of 0.064 mgd. The influent flow has been measured at 0.137 million gallons per day (mgd) for 1044 people. However, effluent average daily flow (0.097 mgd) is reported to be 30 percent lower than influent flow and less than 50 percent of design average daily flow (0.2513 mgd).

Some of the accumulated sludge was removed from the lagoons in 2000. These solids have been stored in onsite (not land applied at agronomic uptake rates) and the permittee does not have authorization for disposal of sludge under EPA Region VIII Permit Number MTG650000, General Permit for Facilities/Operations that Generate, Treat, and/or Use/Dispose of Sewage Sludge by Means of Land Application, Landfill, and Surface Disposal Under the National Pollutant Discharge Elimination System.

The collections system is gravity flow with some areas constructed in 1915 and others in 1960. The GW 2006 PER identified issues related to the collection system regarding inflow and infiltration (I/I) and wet weather flows. There are five street drains currently plumbed in to the sanitary sewer system. Dry season flow to the WWTF from town prior to the transmission main to the lagoons was measured by GW at 0.080 mgd, approximately 76 gallons per capita day (gpcd) with 1044 people on the system as of application update in 2008. After the transmission line influent was measured at 0.137 mgd equating to 131 gpcd. Actual detention time in the lagoon system may be impacted by sludge build up in the cells and I/I flows.

The PER outlined several treatment facility improvement options. The selected alternative includes the addition of a storage cell to the existing facility and land applying treated wastewater.

B. Effluent Characteristics

A summary of effluent quality from facility Discharge Monitoring Reports (DMR) is given in Table 2. The Period of Record (POR) is January 2003 through June 2008. Total nitrogen (TN) and total phosphorus as P (TP) data were obtained from the January through December 1998 facility DMRs.

The 30-day Biochemical Oxygen Demand ($BOD_5$) limit of 45 mg/L was exceeded in February 2004 (62 mg/L). The 30-day Total Suspended Solids (TSS) limit of 100 mg/L was exceeded in April 2008 (107 mg/L).

**Table 2: DMR Effluent Characteristics * for POR January 2003 through June 2008**

| Parameter | Location | Units | Previous Permit Limit | Minimum Value | Maximum Value | Average Value | Number of Samples |
|---|---|---|---|---|---|---|---|
| Flow, Daily Average | Effluent | mgd | (1) | 0.087 | 0.103 | 0.097 | 49 |
| Biochemical Oxygen Demand ($BOD_5$) | Influent | mg/L | (2) | ND | ND | ND | ND |
| | Effluent | mg/L | 45/65 (3) | <4 | 62 | 17.9 | 49 |
| | Effluent | % removal | 65 (2) | ND | ND | ND | ND |
| | Effluent | lb/day | 93 (4) | 2.9 | 45 | 14.5 | 49 |
| Total Suspended Solids (TSS) | Influent | mg/L | (2) | ND | ND | ND | ND |
| | Effluent | mg/L | 100/135 (3) | 3.2 | 107 | 28.4 | 49 |
| | Effluent | % removal | 65 | ND | ND | ND | ND |
| | Effluent | lb/day | 209 (4) | 2.6 | 86.7 | 22.9 | 49 |
| Fecal Coliform Bacteria | Effluent | Number per 100 mL | 200/400 (5) | 1 | 81 | 1 | 21 |
| pH (median value) | Effluent | s.u. | 6.0-9.0 (2) | ND | ND | ND | ND |
| Temperature | Effluent | ºC | (5) | ND | ND | ND | ND |
| Total Residual Chlorine (TRC) | Effluent | mg/L | (5) | ND | ND | ND | ND |
| Total Ammonia as N | Effluent | mg/L | (5, 6) | 2.4 | 27.4 | 12.6 | 12 |
| Total Kjeldahl Nitrogen (TKN) | Effluent | mg/L | (5, 6) | 9.2 | 28.8 | 14.9 | 12 |
| Nitrate + Nitrite as N | Effluent | mg/L | (5, 6) | 0.03 | 0.8 | 0.19 | 12 |
| Total Nitrogen (7) | Effluent | mg/L | (5, 6) | 9.65 | 28.8 | 15.1 | 12 |
| | | lb/day | 41 (4, 6) | 7.8 | 17.3 | 11.4 | 12 |
| Total Phosphorus as P | Effluent | mg/L | (6) | 1.06 | 5.15 | 2.6 | 12 |
| | | lb/day | 10 (4, 6) | 1.4 | 4.3 | 2.2 | 12 |
| Dissolved Oxygen | Effluent | mg/L | (5) | ND | ND | ND | ND |
| Oil and Grease | Effluent | mg/L | (5) | ND | ND | ND | ND |
| Total Dissolved Solids (TDS) | Effluent | mg/L | (5) | ND | ND | ND | ND |

Footnotes:
ND – No data available.
* Conventional and Non-conventional Pollutants only, table does not include information on toxic pollutants.
(1) No effluent limit in previous permit, monitoring requirement only.
(2) Effluent limit but no monitoring required in previous permit.
(3) Limit shown as 30-day average/7-day average.
(4) Nondegradation load.
(5) No effluent limit or monitoring requirement in previous permit.
(6) Data from POR January 1998 through December 1998.
(7) Calculated as the sum of Nitrite and Nitrate as N and TKN concentrations.

C. Compliance History

Three MPDES compliance evaluation inspections have been conducted since January 2003 (May 29, 2003, October 18, 2006, and October 17, 2007). A Capacity, Management, Operations, and Maintenance (CMOM) inspection of the permittee's collections system was completed August 12, 2008.

No permit violations were documented during the May 2003 or October 2006 compliance inspections. In 2003, items noted by the inspector included inadequate laboratory records contents and the handling of sludge removed from the lagoon. In 2006, the inspector identified three items of concern: 1) the need to utilize a duly authorized signatory as required by permit; 2 ) failure to maintain record contents as required; and 3) the need to obtain coverage for sludge handling under the EPA Region VIII Permit Number MTG650000, General Permit for Facilities/Operations that Generate, Treat, and/or Use/Dispose of Sewage Sludge by Means of Land Application, Landfill, and Surface Disposal Under the National Pollutant Discharge Elimination System.

## III. Technology-based Effluent Limits (TBELs)

The Montana Board of Environmental Review has adopted by reference 40 CFR 133 which defines minimum requirements for secondary treatment, or the equivalent, for publicly-owned treatment works (POTW) (ARM 17.30.1209). Secondary treatment is defined in terms of effluent quality as measured by $BOD_5$, TSS, percent removal of $BOD_5$ and TSS, and pH.

These requirements may be modified on a case-by-case basis for facilities that are eligible for treatment equivalent to secondary (TES) treatment [40 CFR 133.101(g)] or alternative state requirements (ASR) for TSS. To determine if a facility is eligible for TES the facility must meet the requirements of 40 CFR 133.101(g), summarized as follows:

1) The $BOD_5$ and TSS consistently achievable through proper operation and maintenance of the treatment works exceed the minimum effluent quality described for secondary treatment (40 CFR 122.102);

2) The treatment works utilize a trickling filter or waste stabilization pond; and

3) The treatment works utilizes biological treatment that consistently achieves a 30-day average of at least 65 percent removal [40 CFR 133.101(k)].

Water quality must not be adversely affected by the application of equivalent to secondary treatment. Effluent limits for $BOD_5$ cannot be relaxed unless the permittee has demonstrated that the relaxed limits will not result in a violation of water quality standards in the receiving water.

In addition to TES, permitting agencies may give special consideration to treatment works that employ waste stabilization ponds as the primary method for treating wastes. ASR may be incorporated into permits for lagoons if historic data for the system indicates that effluent limits

based on TES cannot be achieved. The 30-day ASR for TSS in Montana is 100 mg/L [49 FR 37005; September 20, 1984]; the Department employed a 135 mg/L TSS for a 7-day limit based on best professional judgment. New facilities are not eligible for ASR.

The previous permit TBELs were limited to TES for $BOD_5$ and ASR for TSS (Table 2) with 65 percent removal for both parameters. However, the permittee was not required to self-monitor for percent removal. DMR data show that the WWTF regularly met TES limits for $BOD_5$ and ASR limitations for TSS over the POR. One $BOD_5$ self-monitoring result exceeded the TES 30-day average limit of 45 mg/L (February 2004: 62 mg/L). The $95^{th}$ percentile of the POR $BOD_5$ data is 40 mg/L. One TSS value exceeded the ASR 30-day limit of 100 mg/L for the POR (April 2008: 107 mg/L). The $95^{th}$ percentile of the TSS data is 63 mg/L. The permittee has not been required to collect and analyze influent water quality samples for TSS or $BOD_5$; no percent removal data are available for the WWTF.

For the permit renewal, the $BOD_5$ effluent TBEL will be based on TES and the TSS TBEL will be based on ASR as in the previous permit cycle. The percent removal for both parameters will be 65% year round, as required by 40 CFR 133.105(b).

Compliance with TBELs is required at the last point of control. Dilution from ground water or any other water can not be employed to meet TBELs. The point of compliance for TBELs is at the v-notch weir into BPC.

A. Mass-based Limits

ARM 17.30.1345 [40 CFR 122.45(f)(1)] requires that effluent limits must be expressed in terms of mass (mass/time), except for certain conditions, such as pH or temperature. For municipal treatment plants, mass-based limits are based on the average daily design flow (discussed in Part II) for the facility. Mass-based limits were calculated in the previous permit cycle with the exception of the 7-day loads. The calculations are as follows:

Load (lb/day) = Design Flow (mgd) x Concentration (mg/L) x 8.34 (lb·L)/(mg·gal)

$BOD_5$ mass-based limitation:
7-d Load = 0.2513 mgd x 65 mg/L x 8.34 = 136 lb/day

TSS mass-based limitation:
7-d Load = 0.2513 mgd x 135 mg/L x 8.34 = 283 lb/day

B. Nondegradation

Nondegradation load allocations calculated in the previous permit cycle are given in Table 4 for major constituents in the effluent. These allocations define baseline allocated loads for the WWTF and any increase above this amount is subject to the provisions of Montana's Nondegradation Policy 75-5-303, Montana Code Annotated (MCA) and ARM 17.30.705, *et seq*.

Actual $BOD_5$ and TSS discharge loads from self-monitoring data were calculated by the Department and are compared to the nondegradation loads in Table 3. The permit does not authorize a new or

increased discharge, as defined in ARM 17.30.702(18), and therefore is not subject to the criteria in ARM 17.30.715(1).

**Table 3: Calculated Nondegradation Allocated and Actual Annual Loads**

| Parameter | Allocated Load (lb/day) | Actual 30-Day Average Loads (lb/day) | | | | | |
|---|---|---|---|---|---|---|---|
| | | 2003 (TN and TP 1998) | 2004 | 2005 | 2006 | 2007 | 2008 (Jan.1 to July 1) |
| $BOD_5$ | 93 | 9.0 | 15.2 | 21.5 | 13.5 | 11.9 | 16.4 |
| TSS | 209 | 25.2 | 17.0 | 28.3 | 16.6 | 17.0 | 37.7 |
| TN | 41 | 11.4 | -- | -- | -- | -- | -- |
| TP | 10 | 2.6 | -- | -- | -- | -- | -- |

IV. Water Quality-based Effluent Limits (WQBELs)

Permits are required to include water quality-based effluent limits (WQBELs) when technology-based effluent limits are not adequate to protect state water quality standards (40 CFR 122.44 and ARM 17.30.1344). ARM 17.30.637(2) states that no wastes may be discharged that can reasonably be expected to violate any state water quality standards. Montana water quality standards (ARM 17.30.601, *et seq*.) define both water use classifications for all state waters and numeric and narrative standards that protect those designated uses. New sources, as defined in ARM 17.30.703(16), are subject to Montana Nondegradation Policy (75-5-303, MCA) and regulations (ARM 17.30.701, *et seq.*).

A. Receiving Water

Wastewater is discharged from Outfall 001 to BPC in the meandered swale associated with the Jefferson River. The swale is in the southeastern portion of the large alkaline marsh (475 acres) called the Piedmont Swamp (MT Natural Heritage Data Report, October 2007). BPC flows through the marsh area for approximately 0.5 mile to Whitetail Creek which continues to meander through wetlands for another 0.5 mile to Jefferson Slough and ultimately the Jefferson River**.**

The receiving water is classified as B-1 according to Montana Water Use Classifications, ARM 17.30.610**.** Waters classified B-1 are to be maintained suitable for drinking, culinary, and food processing purposes after conventional treatment; bathing, swimming, and recreation; growth and propagation of salmonid fishes and associated aquatic life, waterfowl, and furbearers; and agricultural and industrial water supply.

BPC in the vicinity of the discharge is considered high quality water pursuant to Montana's Nondegradation Policy. Degradation of high quality water is not allowed unless authorized by the Department under 75-5-303(3), MCA.

BPC is located within the Jefferson River watershed as identified by the USGS Hydrological Unit Code 10020005; Montana stream segment identification number MT41G002_010. The creek is included on both the 1996 and 2006 303(d) lists of impaired waterbodies in need of TMDL development.

The 1996 list shows partial support of aquatic life support and cold water fisheries-trout with nutrients and siltation as probable causes of impairment. Sources were identified as agriculture, channelization, dredging, flow regulation/modification, highway/road bridge construction, irrigated crop production, range land, and streambed modification/destabilization.

The 2006 303(d) list expanded the scope of the listing for this stream segment. The stream is assessed as fully supporting agriculture and drinking water uses but is only partially supporting aquatic life, cold water fishery, industrial uses, and primary contact recreation. Probable causes of impairment are identified as: alteration in stream-side or littoral vegetative covers; physical substrate habitat alterations; other anthropogenic substrate alterations; total nitrogen; total phosphorus; water temperature; and TSS. Probable sources include: agriculture; grazing in riparian or shoreline zones; loss of riparian habitat; channelization; habitat modification (other than hydro-modification); streambank modification/destabilization; forest roads (construction and use); unspecified unpaved road or trail; highway, road, and/or bridge construction and runoff (non-construction related); agriculture; dam or impoundment; sediment (clean) resuspension; and municipal point sources.

The assessment summary for this stream segment specifically associates municipal point sources with impairment for total nitrogen, total phosphorus, water temperature, and TSS. The Whitehall WWTF is the only municipal point source discharging to BPC.

The previous permit perpetuated the 1989-established seven day, ten year low flow condition (7Q10) of 11.7 cubic feet per second (cfs, 7.6 mgd), the lowest flow observed by the Department during basin-wide water quality studies in 1981 and 1982 (measured on October 20, 1981).

On September 17, 1997, the USGS measured flow at 2.8 cfs (1.81 mgd) on a transect 80 feet upstream of an irrigation return drain joining BPC 1,000 feet above the discharge point and again at 3.1 cfs (2.0 mgd) on a transect 20 feet above the outfall location (USGS, March, 1999); the Upper Jefferson River Watershed Council measured BPC flow five miles upstream at the Highway 2 crossing at 3.3 cfs (2.13 mgd) on September 10, 2004 (Upper Jefferson River Watershed Council, January 2005); and the facility PER reported measured flow above the WWTP outfall to be 2.7 cfs (1.74 mgd) on August 5, 2005 (GW, March 2006).

For the purposes of this permit renewal, the 7Q10 value for BPC will be corrected to the mean of these values, 3 cfs (1.94 mgd). This results in a dilution ratio of 7.7; 1.94 mgd/0.2513 mgd, the 7Q10 compared to the average daily design flow of the facility).

The Montana Department of Fish, Wildlife, and Parks MFISH database describes BPC as an area of moderate fisheries resource value for both habitat and sports classifications (October 2008). In the area of discharge, the brown trout is commonly present as a year-round resident. The mottled sculpin and white sucker are rare year-round residents. The rainbow trout may be present downstream of the WWTF at the mouth of BPC but abundance is unknown.

Ambient water quality data for BPC above the outfall location are limited. Diurnal data for September 10, 2004 were compiled in the Upper Jefferson River Watershed 2004 Water Quality Monitoring and Assessment Report, (Upper Jefferson River Watershed Council, January 2005). Multiple samples at two sites were collected on September 17, 1997 for the USGS mixing zone report (USGS, March 1999). A summary of these data is presented in Table 4.

**Table 4. Big Pipestone Creek Ambient Water Quality Data for September 1997 and 2004**

| Parameter | Units | Number of Samples | Long Term Average | Minimum Value | Maximum Value |
|---|---|---|---|---|---|
| pH, median value | s.u. | 10 | 8.2 | 8.1 | 8.3 |
| Temperature | °C | 10 | 10.5 | 10 | 11 |
| Total Ammonia as N | mg/L | 11 | 0.11 | 0.02 | 0.19 |
| Nitrate plus Nitrite as N | mg/L | 11 | 0.11 | <0.10 | 0.16 |
| TN | mg/L | 11 | 0.50 | 0.30 | 0.80 |
| TP | mg/L | 11 | 0.081 | 0.068 | 0.097 |

Footnotes:
(1) Samples collected in September 1997 and 2004, only.

B. Mixing Zone

A mixing zone is an area where the effluent mixes with the receiving water and certain water quality standards may be exceeded [ARM 17.30.502(6)]. The Department must determine the applicability of currently granted mixing zones [ARM 17.30.505(1)]. Mixing zones allowed under a permit issued prior to April 29, 1993 will remain in effect unless there is evidence that previously allowed mixing zones will impair existing or anticipated uses [ARM 17.30.505(1)(c)].

In accordance with ARM 17.30.517(1)(b), acute water quality standards for aquatic life may not be exceeded in any portion of the mixing zone unless the Department finds that allowing minimal initial dilution will not threaten or impair existing uses. The discharge must also comply with the general prohibitions of ARM 17.30.637(1) which require that state waters, including mixing zones, must be free from substances which will:

(a) settle to form objectionable sludge deposits or emulsions beneath the surface of the water or upon adjoining shorelines;
(b) create floating debris, scum, a visible oil film (or be present in concentrations at or in excess of 10 milligrams per liter) or globules of grease or other floating materials;
(c) produce odors, colors or other conditions as to which create a nuisance or render undesirable tastes to fish flesh or make fish inedible;
(d) create concentrations or combinations of materials which are toxic or harmful to human, animal, plant or aquatic life; and
(e) create conditions which produce undesirable aquatic life.

Although certain standards may be exceeded in the mixing zone, an effluent in its mixing zone may not block passage of aquatic organisms nor may it cause acutely toxic conditions [ARM 17.30.602(16)]. No mixing zone will be granted that will impair beneficial uses [ARM 17.30.506(1)]. Aquatic life-chronic, aquatic life-acute and human health standards may not be exceeded outside of the mixing zone [ARM 17.30.507(1)(a)]. Acute standards may not be exceeded in any part of the mixing zone [ARM 17.30.507(1)(b)]. However, ARM 17.30.602(16) states that ammonia, chlorine, and dissolved oxygen may be present at concentrations so as to cause potentially toxic conditions in no more than 10% of the mixing zone provided that there is no lethality to aquatic organisms passing through the mixing zone.

A standard mixing zone may be granted for facilities which discharge less than 1 mgd or when mixing is nearly instantaneous [ARM 17.30.516(3)(d)]. Nearly instantaneous mixing is assumed if the discharge is through an effluent diffuser, when the mean daily flow exceeds the 7Q10 (dilution ratio <1) or the permittee demonstrates through a Department approved study plan that the discharge is nearly instantaneous. A nearly instantaneous mixing zone may not extend downstream more than two river widths.

The WWTF discharge flow is less than 1 mgd and the dilution ratio is 7.7; therefore the facility qualifies for a standard mixing zone and dilution using twenty-five percent of the 7Q10 flow [ARM 17.30.516(3)(b)] which is 0.75 cfs (0.48 mgd). This value of 0.48 mgd will be used in calculations for the purposes of limit development in this permit renewal.

The requirements of 75-5-301(4) MCA state that mixing zones must be the smallest practicable size; have minimal effects on uses; and, have definable boundaries. The previous permit defined the mixing zone as extending to the confluence with Whitetail Creek identified approximately ⅓ to ½ mile downstream from Outfall 001. In the 1997 USGS mixing zone study, the ½ mixing width distance was calculated in accordance with ARM 17.30.516(4) to be 46 feet at stream flows approximating the 7Q10. The standard mixing zone of 10 times the stream width is 95 feet in length. ARM 17.30.516(4) requires a mixing zone to be defined by the more restrictive of these two values. Therefore, the mixing zone length will be 46 feet downstream from the point of discharge. However, it was noted in the same study that mixing was demonstrated to be incomplete at this point.

C. Applicable Water Quality Standards

A discharge to surface water classified B-1 is subject to the specific water quality standards of ARM 17.30.623 (June 30, 2003). In addition, the general provisions of ARM 17.30.635 through 637, 640, 641, 645 and 646 apply unless they conflict with ARM 17.30.623 [ARM 17.30.603(3)]. ARM 17.30.623(2)(b) and (h) incorporates by reference Department Circular DEQ-7 "Montana Numeric Water Quality Standards" (February 2008).

ARM 17.30.637(2) states that no wastes may be discharged that can reasonably be expected to violate any standard. Pollutants typically present in domestic POTW effluent that may exceed water quality standards include TSS, Oil and Grease, *Escherichia coli (E. coli)* bacteria, total residual chlorine when used to control pathogens, total ammonia as nitrogen (N), low levels of dissolved oxygen (DO), temperature, and nutrients [total nitrogen (TN) and total phosphorus as P (TP)].

**Oil and Grease** – ARM 17.30.637 (1) gives general prohibitions to municipal discharges. State surface waters must be free from substances attributable to municipal discharges that will create a visible oil film, or be present at or in excess of 10 mg/L.

***Escherichia coli* (*E. coli*) Bacteria –** The standard for *E. coli* applies year-round. The standards applicable to the receiving surface water are:

a. April 1 through October 31, of each year, the geometric mean number of the microbial species *E. coli* must not exceed 126 colony forming units (cfu) per 100 milliliters (mL), nor are 10% of the total samples during any 30-day period to exceed 252 cfu per 100 mL [ARM 17.30.623(2)(a)(i)]; and

b. November 1 through March 31, of each year, the geometric mean number of *E. coli* shall not exceed 630 cfu per 100 mL and 10% of the samples during any 30-day period may not exceed 1,260 cfu per 100 mL [ARM 17.30.623(2)(a)(ii)].

**Total Residual Chlorine (TRC)** – DEQ-7 lists the chronic and acute standards for TRC as 0.011 and 0.019 mg/L, respectively.

**Total Ammonia as N –** Water quality standards for total ammonia as N are developed from calculations that account for a combination of pH and temperature of the receiving stream, the presence or absence of salmonid species, and the presence or absence of fish in early life stages. Because pH and temperature can vary greatly on a seasonal basis, as can the presence or absence of fish in early life stages allows for the determination of ammonia standards and the resulting limits on a seasonal basis. Salmonid fishes and their early life stages are presumed to be present in BPC year-round.

Minimal pH and temperature data for September 1997 and 2004 have been collected and reported to the Department for the receiving water (see Table 4). These data are not sufficient to determine appropriate instream conditions for calculating chronic or acute standards at this time. However, for the purposes of planning for future upgrades to address total ammonia as N in the effluent, and for the purposes of this discussion, Table 5 presents the total ammonia as N water quality standards, in mg/L, for BPC using the minimal ambient water quality data in Table 4.

**Table 5. Total Ammonia as N Water Quality Standards for Receiving Water.**

| Condition | Period (1) | Salmonids Present | Early Life Stages Present | Ambient Condition | | Water Quality Standard (2) (mg/L) |
|---|---|---|---|---|---|---|
| | | | | pH s.u. | Temperature °C | |
| Acute | Annual | Yes | NA | 8.30 (3) | NA | 3.15 |
| Chronic | Summer | NA | Yes | 8.30 (4) | 11 (4) | 1.52 |

Footnotes: NA – Not Applicable
(1) Summer period is taken to be April 1 through October 31.
(2) Acute - maximum daily; Chronic - 30-day average concentrations.
(3) Based on 95$^{th}$ percentile of annual data.
(4) Based on 75$^{th}$ percentile of values in the applicable period.

**Dissolved Oxygen (DO)** – Freshwater aquatic life standards are characterized by the fishery (cold- or warm-water) and by the presence or absence of fish early life stages. Standards are further defined based on a time frame and required DO levels. B-1 waterbody classification states the receiving waters are cold-water fisheries. DO standards for B-1 waters are given in Table 6.

**Table 6: B-1 Water Classification Dissolved Oxygen Standards (DEQ-7, 2008).**

| Dissolved Oxygen | 30-Day Mean (mg/L) | 7-Day Mean (mg/L) | 7-Day Mean Minimum (1) (mg/L) | 1-Day Minimum (1) (mg/L) |
|---|---|---|---|---|
| Early Life Stages (2, 3) | N/A | 9.5(6.5) | N/A | 8.0(5.0) |
| Other Life Stages | 6.5 | N/A | 5.0 | 4.0 |

Footnotes:
"N/A" means "Not Applicable".
(1) All minima should be considered as instantaneous concentrations to be achieved at all times.
(2) These are water column concentrations recommended to achieve the required inter-gravel dissolved oxygen concentrations shown in parentheses. For species that have early life stages exposed directly to the water column, the figures in parentheses apply.
(3) Includes all embryonic and larval stages and all juvenile forms of fish to 30-days following hatching.

**Nutrients [TN and TP] –** The receiving water is listed as impaired due to nutrients from municipal point sources. Currently there are no water quality standards for TN and TP in BPC.

D. Proposed WQBEL/WLA

Permits are required to include WQBELs when technology-based effluent limits are not adequate to protect water quality standards (40 CFR 122.44, ARM 17.30.1344). ARM 17.30.1345 requires WQBELs to be developed for any pollutant for which there is reasonable potential (RP) for discharges to cause or contribute to exceedences of instream numeric or narrative water quality standards. RP calculations utilize the receiving water concentration, the maximum projected effluent concentration, the design flow of the wastewater treatment facility, and the applicable receiving water flow.

The permittee has not collected effluent quality data for parameters other than those requiring TBELs. Receiving water quality data are lacking. RP cannot be assessed adequately at this time to propose WQBELs. However, for the purposes of planning for future upgrades to address potential WQBELs, and for purposes of this discussion, the Department uses a mass balance equation to determine RP (*Equation 1*).

$$C_{RP} = \frac{C_E Q_E + C_S Q_S}{Q_E + Q_S} \qquad \textit{(Equation 1)}$$

Where:

$C_{RP}$ = receiving water concentration (RWC) after mixing, mg/L
$C_E$ = maximum projected effluent concentration, mg/L
$C_S$ = RWC upstream of discharge, mg/L
$Q_S$ = applicable receiving water flow, 25% of the 7Q10, mgd
$Q_E$ = facility average daily design flow rate, mgd

**TSS -** The facility provides a significant reduction in biological material and solids through secondary treatment (Section III). However, BPC remains on the 2006 303(d) list as impaired for TSS due to municipal point sources. The previous permit applied ASR limitations for TSS at 100 mg/L for a 30-day average and 135 mg/L as a 7-day average. Due to the continued listing for TSS, the effluent TSS limits will be reduced to TES limits. Limits will be established at 45 mg/L as a 30-day average and 65 mg/L as a 7-day average with the TES 65% removal requirement applied.

The mass-based expressions of these concentration limits are calculated as follows:

Load (lb/day) = Design Flow (mgd) x Concentration (mg/L) x 8.34 (lb·L)/(mg·gal)

30-d TSS Load = 0.2513 mgd x 45 mg/L x 8.34 = 94 lb/day
7-d TSS Load = 0.2513 mgd x 65 mg/L x 8.34 = 136 lb/day

**Oil and Grease** – The previous permit had no effluent monitoring requirement or limitation. Quarterly monitoring for oil and grease will be required.

***Escherichia coli* (*E. coli*) Bacteria –** The facility currently uses UV light for disinfection. The permit will incorporate the Montana state standards for *Escherichia coli* (*E. coli*) bacteria.

**TRC** – The present facility does not have chlorination capability. No limit for TRC is necessary at this time.

**Total Ammonia as N –** The previous permit required only one year of effluent monitoring for total ammonia as N (January 1998 through December 1998, see Table 4). If the nature and concentration of waste treated at the WWTF has not altered since 1998, RP for exceedences of the receiving water standards could be calculated for permit renewal. However, because of the lack of current effluent data, as well as data available to establish instream standards, no RP will be assessed or limits developed during this permit cycle. Effluent and instream monitoring for total ammonia as N, pH, and temperature will be required.

For the purposes of establishing the need for the permittee to plan for future upgrades to address total ammonia as N in the effluent, and for this discussion only, the calculation for assessing RP will be presented using the minimal ambient water quality data in Table 4 and *Equation 1*, where:

$C_{RP}$ = receiving water concentration (RWC) after mixing, mg/L
$C_E$ = maximum projected effluent concentration (27.4 mg/L)
$C_S$ = RWC upstream of discharge (0.11 mg/L)
$Q_S$ = applicable receiving water flow, 25% of the 7Q10 (0.48 mgd)
$Q_E$ = facility average daily design flow rate (0.2513 mgd)

$$C_{RP} = \frac{(0.2513*27.4) + (0.48*0.11)}{(0.2513 + 0.48)} = 9.49 \text{ mg/L}$$

This value is greater than any of the calculated total ammonia as N standards, therefore, RP could be considered to exist for this parameter and limits could be considered necessary. The calculations for

limit development are presented in Attachment A. Potential limits could be on the order of 4.2 mg/L total ammonia as N for the average monthly limit and 5.8 mg/L as the maximum daily limit value.

**Dissolved Oxygen (DO)** – The previous permit did not require monitoring for DO levels in the effluent. Monthly monitoring and reporting of DO will be implemented with this permit renewal.

**Nutrients (TN and TP) –**The previous permit required only one year of effluent monitoring and reporting for TN and TP (January 1998 through December 1998). The current nutrient loads discharged from the WWTF is unknown and load limits cannot be established at this time. Monthly monitoring and reporting for TN and TP will be reinstated with this permit renewal.

**Whole Effluent Toxicity (WET) Testing -** ARM 17.30.637(2)(d) prohibits discharges to state waters that would create concentrations or combinations of materials which are toxic or harmful to human, animal, plant or aquatic life. The Department may require WET testing based on criteria listed in ARM 17.30.1322(4)(j), which includes permittees with design flows greater than 1 mgd, POTWs with pretreatment programs, or other instances including variability of pollutants based on the treatment, dilution of the effluent in the receiving water, and/or receiving stream characteristics, including possible water quality impairment.

The Whitehall WWTF design flow is less than 1 mgd and there are no significant industrial contributors. WET testing is not necessary in this permit cycle.

V. Final Effluent Limits

**Table 7. Outfall 001 Final Effluent Limitations**

| Parameter | Units | Average Monthly Limit (1) | Average Weekly Limit (1) | Maximum Daily Limit |
|---|---|---|---|---|
| $BOD_5$ | mg/L | 45 | 65 | -- |
| | lb/day | 94 | 136 | -- |
| TSS | mg/L | 45 | 65 | -- |
| | lb/day | 94 | 136 | -- |
| *E. coli* Bacteria, summer (2, 3) | cfu/100 mL | 126 | 252 | -- |
| *E. coli* Bacteria, winter (3, 4) | cfu/100 mL | 630 | 1,260 | -- |

Footnotes:
1. See Definition section at end of permit for explanation of terms.
2. Summer period is April 1 through October 31, annually.
3. Geometric mean value.
4. Winter period is November 1 through March 31, annually.

pH: Effluent pH from Outfall 001 shall remain between 6.0 and 9.0 standard units (instantaneous minimum and instantaneous maximum) unless a variation is due to natural biological processes. For compliance purposes, any single analysis or measurement beyond this limitation shall be considered a violation of the conditions of this permit.

65 Percent (%) Removal Requirement for $BOD_5$: The arithmetic mean of the $BOD_5$ for effluent samples collected in a period of 30 consecutive days shall not exceed 35% of the arithmetic mean of the values for influent samples collected at approximately the same times during the same period (65% removal). This is in addition to the concentration limitations on $BOD_5$.

65 Percent (%) Removal Requirement for TSS: The arithmetic mean of the TSS for effluent samples collected in a period of 30 consecutive days shall not exceed 35% of the arithmetic mean of the values for influent samples collected at approximately the same times during the same period (65% removal). This is in addition to the concentration limitations on TSS.

There shall be no discharge of floating solids or visible foam in other than trace amounts.

There shall be no discharge which causes visible oil sheen in the receiving stream.

## VI. Monitoring Requirements

### A. Influent/Effluent Monitoring

The sampling and monitoring location for influent shall be established after the sewer transmission line to the WWTF and before discharge into the facultative cells. Effluent quality shall be sampled and monitored after UV disinfection at the last point of control prior to discharge to BPC.

**Table 8. Monitoring Requirements – Outfall 001**

| Parameter | Units | Sample Location | Sample Frequency | Sample Type (1) | RRV (2) |
|---|---|---|---|---|---|
| Flow | mgd | Effluent | 1/Week | Instantaneous | --- |
| $BOD_5$ | mg/L | Influent | 1/Month | Composite | 5 |
| | mg/L | Effluent | 1/Week | Composite | 5 |
| | % Removal | Effluent | 1/Month | Calculated | --- |
| | lb/day | Effluent | 1/Month | Calculated | --- |
| TSS | mg/L | Influent | 1/Month | Composite | 10 |
| | mg/L | Effluent | 1/Week | Composite | 10 |
| | % Removal | Effluent | 1/Month | Calculated | --- |
| | lb/day | Effluent | 1/Month | Calculated | --- |
| pH | s.u. | Effluent | 1/Week | Instantaneous | 0.1 |
| Temperature | °C | Effluent | 1/Week | Instantaneous | --- |
| *E. coli* Bacteria | cfu/100 mL | Effluent | 1/Week | Grab | 1/100 mL |
| Oil and Grease (3) | mg/L | Effluent | 1/Month | Grab | 1 |
| Total Ammonia as N | mg/L | Effluent | 1/Month | Composite | 0.05 |
| Nitrate + Nitrite as N | mg/L | Effluent | 1/Month | Composite | 0.01 |
| Total Kjeldahl Nitrogen | mg/L | Effluent | 1/Month | Composite | --- |
| Total Nitrogen (4) | mg/L | Effluent | 1/Month | Calculated | --- |
| | lb/day | Effluent | 1/Month | Calculated | --- |
| Total Phosphorus as P | mg/L | Effluent | 1/Month | Composite | 0.001 |
| | lb/day | Effluent | 1/Month | Calculated | --- |
| Total Dissolved Solids (TDS) | mg/L | Effluent | 1/Quarter | Composite | 10 |
| Dissolved Oxygen (DO) | mg/L | Effluent | 1/Month | Instantaneous | 0.05 |

Footnotes:

(1) See Definition section at end of permit for explanation of terms.

(2) The Required Reporting Value (RRV) is the detection level that must be achieved in reporting surface water or ground water monitoring or compliance data to the Department. The RRV is the Department's best determination of a level of analysis that can be achieved by the majority of the commercial, university, or governmental laboratories using EPA-approved methods or methods approved by the Department.

(3) Use EPA Method 1664, Revision A: N-Hexane Extractable Material (HEM).

(4) Calculated as the sum of Nitrate + Nitrite as N and TKN concentrations.

B. Instream Monitoring

The receiving water lacks ambient monitoring data to develop discharge limitations. The permittee will establish an instream sample point at a location upstream of the influence of Outfall 001 and downstream of any tributary or irrigation return flow.

**Table 9. Big Pipestone Creek Ambient Monitoring Requirements**

| Location | Parameter | Units | Sample Frequency | Sample Type (1) |
|---|---|---|---|---|
| Big Pipestone Creek: Upstream of discharge at Outfall 001 and downstream of any tributary or irrigation return flow. | Total Ammonia as N | mg/L | 1/Month | Grab |
| | pH | s.u. | 1/Month | Instantaneous |
| | Water Temperature | °C | 1/Month | Instantaneous |
| | TN (2) | mg/L | 1/Quarter | Grab |
| | TP | mg/L | 1/Quarter | Grab |

Footnote:
(1) See Definition section at end of permit for explanation of terms.
(2) Calculated as the sum of Nitrate + Nitrite as N and TKN concentrations

VII. Other Information

On September 21, 2000, a U.S. District Judge issued an order stating that until all necessary total maximum daily loads (TMDLs) under Section 303(d) of the Clean Water Act are established for a particular water quality limited segment, the State is not to issue any new permits or increases under the MPDES program. The order was issued in the lawsuit Friends of the Wild Swan v. U.S. EPA, *et al.* (CV 97-35-M-DWM), District of Montana and Missoula Division. The renewal of this permit does not conflict with Judge Molloy's order because this is not a new or increased discharge under MPDES.

VIII. Information Source

1. Administrative Rules of Montana Title 17 Chapter 30 - Water Quality
   a. Sub-Chapter 2 - *Water Quality Permit and Application Fees*, November 2003.
   b. Sub-Chapter 5 - *Mixing Zones in Surface and Ground Water*, November 2004.
   c. Sub-Chapter 6 - *Montana Surface Water Quality Standards and Procedures*, September 2004.
   d. Sub-Chapter 7- *Nondegradation of Water Quality*, November 2004.
   e. Sub-Chapter 10 - *Montana Ground Water Pollution Control System,* September 2004.
   f. Sub-Chapter 12 - *Montana Pollutant Discharge Elimination System (MPDES) Standards*, March 2003.
   g. Sub-Chapter 13 - *Montana Pollutant Discharge Elimination System (MPDES) Permits*, March 2003.

2. Clean Water Act § 303(d), 33 USC 1313(d) *Montana List of Waterbodies in Need of Total Maximum Daily Load Development*, 1996 and 2006.

3. Federal Water Pollution Control Act (Clean Water Act), 33 U.S.C. §§ 1251-1387, October 18, 1972, as amended 1973-1983, 1987, 1988, 1990-1992, 1994, 1995 and 1996.

4. Great West Engineering, Preliminary Engineering Report (PER) Wastewater System Improvements prepared for the Town of Whitehall, March 2006.

5. Montana Code Annotated Title 75 - Environmental Protection Chapter 5 - Water Quality, October 2002.

6. Montana Department of Environmental Quality Circular DEQ-2, *Design Standards for Wastewater Facilities,* September 1999.

7. Montana Department of Environmental Quality Circular DEQ-7, *Montana Numeric Water Quality Standards*, February 2008.

8. Montana Department of Fish Wildlife and Parks, *Spawning Times of Montana Fishes*, March 2001.

9. Montana Pollutant Discharge Elimination System (MPDES) Permit Number MT0020133
   a. Administrative Record.
   b. Renewal Application Forms DEQ-1 and EPA Form 2A, January 2008.

10. S & A Engineers, Wastewater Treatment Facility Operation and Maintenance Manual, Town of Whitehall, Montana, July 1988.

11. Upper Jefferson River Watershed Council, 2004 Water Quality Monitoring and Assessment Report, Land & Water Consulting, Inc., January 2005.

12. US Code of Federal Regulations, 40 CFR Parts 122-125, 130-133, & 136.

13. US Code of Federal Regulations, 40 CFR Part 403 – *General Pretreatment Regulations for Existing and New Sources of Pollution.*

14. US Code of Federal Regulations, 40 CFR Part 503 – *Standards for the Use or Disposal of Sewage Sludge.*

15. US Department of the Interior US Geological Survey, *Effluent Mixing Characteristics below Four Wastewater Treatment Facilities in Southwestern Montana, 1997*, Water-Resources Investigations Report 99-4026, 1999..

16. US Department of the Interior US Geological Survey, *Statistical Summaries of Streamflow in Montana and Adjacent Areas, Water Years 1900 through 2002*, Scientific Investigations Report 2004-5266, 2004.

17. US EPA *Technical Support Document for Water Quality-Based Toxics Control*, EPA/505/2-30-001, March 1991.

18. US EPA NPDES *Permit Writers' Manual*, EPA 833-B-96-003, December 1996.

19. US EPA Region VIII NPDES *Whole Effluent Toxics Control Program*, August 1997.

20. US EPA *NPDES Permit Writers' Course Manual*, EPA-833-B-91-001, April 2003.

Prepared by: MK Valett October 31, 2008

Attachment A.

| | |
|---|---|
| **Parameter:** | **Total Ammonia as N** |
| **Restriction:** | **September** |
| **Facility:** | **Town of Whitehall** |
| **MPDES Permit Number:** | **MT0020133** |
| **Receiving Water:** | **Big Pipestone Creek** |
| **Date:** | **October 14, 2008** |

| **Condition** | | **%** | **Chronic** | **Acute** | **Other** |
|---|---|---|---|---|---|
| Acute Standard | mg/L | | | 3.15 | |
| Chronic Standard | mg/L | | 1.52 | | |
| Acute to Chronic Ratio (ACR) | | | | | 2.07 |
| **Mixing Zone** | | | | | |
| 7Q10 | mgd | | 1.92 | | |
| Chronic MZ | mgd | 25 | 0.48 | | |
| Acute MZ | mgd | 25 | | 0.48 | |
| | | | | | |
| Effluent Flow (Average Daily Design Flow) | mgd | | 0.251 | 0.251 | |
| | | | | | |
| Water Quality Standard | mg/L | | 1.52 | 3.15 | |
| Background Concentration (Instream) | mg/L | | 0.11 | 0.11 | |
| | | | | | |
| Wasteload Allocation (from mass balance) | | | | | |
| $WLA_{chronic}$ | mg/L | | 4.21 | | |
| $WLA_{acute}$ | mg/L | | | 8.96 | |
| | | | | | |
| Long-Term Average –Calculated | | | | | |
| Coefficient of Variation (CV) | na | | | | 0.6 |
| Percentile | % | | | | 95 |
| $LTA_{chronic}$, multiplier Table 5-1 | | | 0.644 | | |
| $LTA_{acute}$, multiplier Table 5-1 | | | | 0.468 | |
| $LTA_{chronic}$ | mg/L | | 2.71 | | |
| $LTA_{acute}$ | mg/L | | | 4.19 | |
| | | | | | |
| $LTA=min(LTA_{chronic}, LTA_{acute})$ | mg/L | | 2.71 | 2.71 | |
| | | | | | |
| AML, multiplier Table 5-2 | | | 1.55 | | |
| MDL, multiplier Table 5-2 | | | | 2.13 | |

| | | **Average Monthly Limit (AML)** | **Maximum Daily Limit (MDL)** |
|---|---|---|---|
| **Final Effluent Limits** | **mg/L** | **4.2** | **5.8** |